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Cardiac neurosis

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CARDIAC NEUROSES

by

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Senior Thesis Presented to the
College of Medicine, University
of Nebraska

Omaha, Nebraska - 1937

.....

"It is important to ascertain what sort of patient the disease
has as well as what sort of disease the patient has." H.M.Pollack (47)

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In our clinics, ward rounds, and dispensary services, patients have been cliniced as diseased organ carriers rather than as individuals. What he may be thinking while the Doctor is discussing the prognosis of the case; what emotional problems he is experiencing; how his illness is affecting his economic status, his family, and friends has nothing to do with his disease process. Treatment is discussed not from the viewpoint of the patient, but from the standpoint of the disease. We, as students have learned practically nothing about the handling of patients. The reason is obvious - there is not time in a crowded curriculum as ours, to devote to such problems.

It is for this reason that I thought such a subject would probably give me some insight into the handling of the psychic factors of a disease. Since the linking of emotional life and the heart has always been particularly close it seemed logical that "Cardiac Neuroses" would bear the most fruit in an investigation of the emotional factors in disease.

Out of the vast store of literature on this subject, I have tried to summarize and condense from it the more widely agreed upon opinions and observations pertinent to this subject, during the last century, by selecting articles of a more representative nature, starting with Hope's "Treatise on Diseases of

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the Heart"(30) in 1846 and ending with Dunbar's Book "Emotions and Bodily Changes" in 1936 (18). DaCosta (14) and Lewis (39) have written classical works on Neurocirculatory asthenia as seen in soldiers and their works were used as a basis for this phase of the subject.

Particular emphasis was placed upon Etiology, since it is upon this that good treatment is based.

Ralph C. Moore

Omaha, Nebraska - March, 1937.

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General Statement

"The trend in modern medicine away from specialization and away from treating diseased hearts and livers as if they were organs for which the patient's body provided a sort of test tube, and in treatment of which his personality was irrelevant, has been accompanied by a rapidly changing attitude toward psychiatry." (17) This has been brought about both by development of psychiatry and by recent advances in medical and biological research. Both of these developments converge on the problem of psychosomatic relationships in health and disease. Biological research has shown the importance of the whole to an understanding of the parts. We must think in terms of two integrations - the integration of the organism within itself and of the organism in its environment. It was stressed by Hippocrates that the individual was most important in treating illness and this idea has remained with the general practitioner more or less since; but it is only just beginning to significantly mold medical practice since experimental science as well as clinical experience has shown it to be basic.

Actually there are psychic and somatic components in all illness which are coexistent and interdependent. (17)

".....in studying neuroses expressed through the vascular system it is wholly inadequate to think in terms of neurology and nervous stimuli. We must think in terms of equilibrium of the various elements involved, that is,

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of the physiological process in which the activity of the nervous system itself constitutes only a link, e.g. the chemical environment of a heart muscle fiber is just as important in determining its contraction as is the stimulation it receives." (17)

Of all the psychosomatic relationships, those bound up with the cardiovascular system have remained probably the closest to the threshold of consciousness. The relationship of the feelings to the heart have been carried through the ages in literature. In all languages there are expressions such as "love comes from the heart", people are "soft hearted", "warmhearted," show "heartfelt sympathy," or they are "heartless," "cold-blooded," etc. (60)

History

It has been recognized for centuries that there was a relationship between the heart rate and rhythm and the emotions (27). In the past, as in the present, the differential diagnosis between organic heart disease and cardiac neuroses has puzzled physicians. Hippocrates recognized that palpitation might result from emotion and excitement (19). Plato (427-347 B.C.) considered the heart in a more or less philosophical sense. The heart was considered by him as the seat of higher emotions while the other viscera, such as the liver, controlled the baser feelings.(4). Galen's account of his patient whose psychoneurotic symptoms arose as a result of her love for the actor Pylades is a good example of the knowledge of

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the heart and emotions at that time. Galen found when the name of the girl's lover was mentioned her heart became peculiarly agitated and the rythm irregular, thus indicating "mental disturbance just as happens to combatants in a fight." This is important when it is realized that this happened in the second century after Christ.(27)

Corvissart in 1811 advised against regarding palpitations in all cases as evidence of heart disease. In this essay on "Heart Disease" dedicated to Napoleon, he wrote:

"To regard palpitations generally and in all cases as signs of heart disease would be into an error which an alert and impartial practitioner cannot commit, an error all the more to be condemned since it may bring dispair to the souls of individuals temporarily affected with palpitations which have no gravity."(56)

Cardiac neuroses were recognized definitely in 1836 by Dr. Calthrop Williams of London, who said:

"Allowing, however, that disease of the heart has increased of late years, we have a clear and important explanation of the fact.

"With the advance of civilization, the physical and moral system of man becomes more sensitive, and then the passions necessarily aquire a greater influence over the animal organization; the more, also, the passions are curbed, after being once strongly excited and exercised, the more baneful is their influence on the nervous system, until they are completely subdued.

"When we reflect, therefore, on the powerful influence that mental emotions exercise over the action of the heart; on the changes affected, in this respect, by anger, hatred, and revenge - by love, joy, or sorrow - by avarice, and ambition; when we credit our former assertion that functional derangement will terminate in organic disease, and that this functional derangement is daily and hourly produced by the activity of these feelings; then we are bound to believe that disorders

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of the circulation and the heart have increased of late years, and will still increase in proportion as the nervous system is affected by the more frequent and ardent operation of the passions..." (26)

"The researches of Heberden in the eighteenth century and Latham in the nineteenth century have established that whatever may be the immediate cause of pain and sensation of approaching death, these symptoms are often met with in connection with some form of organic disease of the heart" but there might be inorganic causes for the same set of symptoms, was stated by Stokes in 1855 (53). He believed that Graves' disease with the various signs and symptoms referable to the thyroid gland was originally a neurosis of the heart and perhaps also of the cervical vessels, basing his opinion on the observations that the principal seat of the thrill and murmur over the gland was in the dilated veins - he noted that the heart under certain circumstances might become permanently excited, and this state was attended with "...three remarkable phenomena, namely, the turgescence of the thyroid gland; the increased action of the arteries of the neck; and the enlargement of the eyeballs. This condition is not attended with fever or signs or symptoms of cardiac inflammation but is more related to functional disturbance.....It exhibits exacerbations and remissions at various periods which appear to depend on the condition of the heart's action...There is probability that the sensa-

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tion termed "globus hystericus" may proceed from the temporary existence of the first stages of this affection." (53)

Austin Flint, in 1859, also discussed the subject. Myers in 1870 was probably the first to describe in detail the condition now known as Neurocirculatory asthenia. (19) DaCosta in 1871 published an account of the affections which he called "Irritable Heart of Soldiers" being a report of cases followed during and after the Civil War. He was the first American to describe this syndrome. (14). Osler in 1887, Broadbent in 1897, and Allbutt in 1898 wrote of this functional disorder of the heart; Osler's paper was entitled "The Irritable Heart of Civil Life" and in it Osler stated that the same symptoms and signs described by DaCosta in soldiers were common in civilians. (19) During the World War Sir Thomas Lewis gave the name "Effort Syndrome" to the condition and later published a monograph on the subject (39) In 1918 a new term was introduced, "Neurocirculatory asthenia", first suggested by B.S. Oppenheimer, S.A. Levine, R.A. Morrison, M.A. Rothschild, W. St. Lawrence, and F.N. Wilson, officers in the United States Medical Reserve Corps, attached to the Military Heart Hospital at Colchester England, to study the condition under Lewis. It is of interest that it is not now generally known who suggested the term. They thought the term "Disordered Action of the Heart" would cause the patient to concentrate his attention

on his heart. "Effort Syndrome" was not desirable because the same syndrome could be produced in a normal man after effort.(19)

Anatomy

Neural Mechanism of the Heart

Anatomy - The heart is supplied with three sets of nerves; two sets of efferent fibers, inhibitory and accelerator, and the afferent fibers. The inhibitory fibers arise in the medulla and pass to the heart through the cardiac branches of the vagus, to the sino-auricular and auriculoventricular nodes of the heart, and end in the ganglion cells, whence other fibers proceed along the course of the auriculo-ventricular conduction system. The accelerator fibers arise in the spinal cord, pass to the upper four or five thoracic nerves, and then to the inferior cervical and upper thoracic sympathetic ganglia containing the ganglion cells, and from these cells the fibers proceed to the nodes of the heart through the cardiac nerves. The afferent fibers arise in the heart, particularly in the pericardium and endocardium, and pass to the medulla and spinal cord through the vagus and sympathetic nerves.(20)

Physiology - The inhibitory fibers of the vagus convey stimuli which slow the heart. The sympathetic fibers convey stimuli which increase the heart rate and force of contraction; afferent fibers

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carry stimuli to the central nervous system. "The central nervous system, acting through these nerves on the heart, and being acted on in turn by the heart, is responsible for the symptoms of cardiac neurosis"(56)

The heart itself is insensitive. Stimulation of the afferent fibers brings no sensation. This was known to Harvey who had the opportunity to observe a man who had lost part of his thoracic wall. Singer showed experimentally that injury of the adventitia of the aorta or coronary arteries produced pain but that the heart itself was insensitive. (5)

"The psychic reaction to doubt concerning the integrity of the heart seems to be much more violent and profound than is the case with any of the other internal organs. Most persons who would accept with considerable equanimity, the knowledge that they had some disease of the liver or kidneys or lungs, would have their morals sadly shaken by any evidence that the heart is not functioning properly. Their symptoms are associated with sudden and unforeseen death, which is probably the reason why cardiac neuroses are so important in the organ neuroses. (10)

Definition - A cardiac neurosis is a visceral or organ neurosis. It is a disorder of the physiologic action of the heart produced by an emotional reaction of the patient. (26) It is the persistent fear of premature death or invalidism through the medium of heart disease (48)

Incidence - Cardiac neuroses are found in all ages, both sexes, in all social conditions, and all degrees of intelligence. (20) There was found to be a wider variation in ages in civilian cases than in wartime cases (effort syndrome) due to dealing with a wider variability in age groups in peacetime communities. In Craig and White's series Ages ranged from twelve to sixty-nine years with an average of thirty three (thirty-one for pure neurosis

and forty for neurosis plus organic disease) in a series of 100 cases, fifty with pure neurosis and fifty with complicating organic disease. In this group were sixty-nine females, and thirty-one males. Out of these only 9% were undernourished and poorly developed the rest were well nourished or obese.(11)

In Nesbit's series over half of the cases were in the third or fourth decade of life, females predominating. In his hospital and clinic series cardiac neuroses composed 10% of all heart cases and 3-5% neuroses complicating organic heart disease.(44)

Dunbar⁽¹²⁾ gives the following classification according to age:

1. Neurotics - ages 30-40
2. Hypertension - ages 38-60, with greatest psychic element in ages 30-45
3. Mitral stenosis - ages 25-42
4. Angina pectoris - ages 50-60
5. Neurotic complications of organic disease - ages 40-50

Edwards and White (19) in a series of 5000 consecutive patients with cardiac symptoms and signs seen in their private practice in New England over a period of thirteen years, found 687 cases, or 13.7%, had Neurocirculatory asthenia, and of these the following:

1. Uncomplicated by Organic Disease.....65.2%
2. Complicated by Organic Disease.....19.6%

3. Doubtful Organic Disease.....15.2%
4. Females.....61.7%
5. Males.....38.3%
6. Age group 30-50.....51.0%

Of those complicated by organic disease:

1. Rheumatic heart disease.....44.4%
2. Coronary disease.....21.4%
3. Hypertensive heart disease.....10.0%

According to them, the chances are three to one that a patient coming to the doctor with cardiac symptoms will not have organic heart disease. Even though the organic disease may be present in some, the symptoms will be entirely those of the complicating Neurocirculatory asthenia. (19)

Classification - It is difficult to make any definite classification, since none of the cases fall into any special group but for sake of convenience the following classification has been used. (56)

1. Fatigue Neurosis

A. Civilian

B. Military

(1) Before service

(2) After service

2. Introspection neurosis
3. Anxiety neurosis
4. Substitution neurosis
5. Obsession neurosis

Love(40) Gives the following classification:

1. Those patients who have been told they had heart disease and consequently no longer lived normal active lives.
2. Patients with organic disease but with symptoms out of proportion to the degree of cardiac incapacity.
3. Those with symptoms an expression of underlying emotional difficulty

Functional disorders may be roughly classified as those due to psychic disturbances; those caused reflexly by diseases elsewhere; and those due to such toxic substances as tobacco, coffee, etc. (45)

Classification of etiology

White and Craig in a series of 100 cases, 50 with organic disease, and 50 without found the following: (11)

1. After severe infection9%

2. After prolonged strain10%
3. After slight infection.....25%
4. After moderate work or strain.36%
5. Little or no strain.....20%

Historical considerations - Stokes ideas of etiology - 1855

Stokes divided nervous diseases of the heart into two classes. (1) Those in which organic disease was absent, and (2) those in which nervous palpitation was dependent upon, or coincident with, a general morbid state. (53)

There is a variety of structural diseases, deranged innervation predominating. It is probable that uncomplicated neurosis is not met with. A marked derangement of action of the heart in many cases becomes a habit or custom of the heart in consequence of some influence of a sympathetic nature, or as in the case of hysteric disease, the accidental localization of a "wandering neurosis," which affects one, now the other organ.

He also notes "non-inflammatory excitement of the heart in advanced stages of typhus." Another series of cases is that in which the "heart's action is excited or irregular, apparently from action of some organic sympathy. A common example of union of hepatic and cardiac symptoms."

Tobacco as an etiological agent is discussed by him. He

noted the practice of swallowing tobacco juice resorted to by malingerers in the army for the purpose of producing violent and irregular palpitations. He attributed its action, however upon the irritation of the stomach, rather than upon any effect by tobacco itself. He claims that the most common cause of functional derangement of the heart is derangement of the stomach. (53)

General Considerations

Cardiac neurosis is not a disturbance of the heart or of the nerve control of the heart but of the personality as a whole(31). G. von Bergmann claims that there is no real basis for "organic" or "functional" terms. We should think of the organ in terms of its disturbed function - the mechanism of its production may or may not be demonstrable as an anatomical lesion, and the degree of the production of a lesion depends upon the changes which are reversible and irreversible in a series terminating in the gross anatomical.(18)

There are a number of factors to be considered when asking why some circumstance should cause such an emotional reaction in one person, and not in another. Those of a more general nature are as follows:

1. Personality makeup of the person
2. His background, and teaching.

3. Misconceived ideas of heart trouble from improper associations etc.
4. Information received through advertising, quacks, superstition, and such avenues of false information.(49)

Agressive tendencies - While psychoanalytic studies of cardiac cases are too few for any definite conclusions, it appears that heart disease and symptoms sometimes are reflections of strongly aggressive tendencies which have been totally repressed (43)

Heart Consciousness - The appearance of some symptom calling attention of the patient to his heart such as arrhythmia, a twinge of precordial pain, palpitation, dyspnea, etc. often being noticed after convalescing from some illness. The statement of some physician or life insurance examiner that the heart shows some abnormality such as a murmur or irregular rythm or perhaps only mere assumption on the part of the patient because two or three doctors listened to his heart can cause the patient concern about his heart. The slightest suggestion that there may be something wrong with his heart will set up a chain of emotions leading to cardiac symptoms eventually. Perhaps the occurrence of some dramatic case of heart disease (maybe with sudden death) among relatives or friends of the patient can be another factor. (10)

Heredity and Family Background - Practically all writers agree

that this factor is one of the most important of all the general etiological agents. There is a hereditary factor but family and other environmental factors have much more to do with their development. (7) The neurocirculatory instability runs in families and occurs along with other constitutional inferiorities, in most cases.

Development of reaction-type - Persons with neurotic tendencies do not develop these reactions out of thin air. In determining the etiological factors in any nervous disorder the entire life-background of the individual must be studied. The attitude toward all problems of life is best seen in the reactions of the patient as a child. The life-pattern is usually shown in the first five years or so. Investigation may also reveal any inherited or acquired weakness showing up at this time. (9) These patients may be found to have been emotionally unstable since childhood - night terrors, enuresis, temper tantrums etc. (40) somnambulism, chorea, convulsions, and exaggerated emotional reactions (8) are all early manifestations of suggestive character. Hereditary factors that may be brought to light are: insanity, epilepsy, migraine, alcoholism or similar maladaptation, invalid type of reaction, eccentricities, and mental defect. (8)

Later in the individual's life when we find him under the strain of some social problem for the correct solution of

which he has not been properly prepared, we find the consequent emotional tensions expressing themselves by the disfunction of his organs. It is significant that the affected organs usually show signs of imperfect development or for some reason in his development, have come to be overvalued in the patient's psyche. These organs, the effector structure of which is smooth or striated muscle, become, in a manner of speaking, the patient's "voice-box" - they express his attitude toward life and toward the particular problem with which he is confronted. In other words, "the weakest link bears the strain." The individual reacts as a unity to the unity of his environment. "The whole is not a sum of its parts, it is something more; a new function has appeared, a function characteristic of unity." (9)

The patient's reactions to authority, feelings of inferiority, poor handling of the incipient sexual instinct, episodes of great emotional value, all leave the patient permanently modified. (40)

"As a result of various stress and strain, irritability and fatigability of the heart and its nervous mechanism is produced which gives rise to symptoms which present the more or less characteristic picture." One person will show gastro-intestinal symptoms, another nervousness, and another Neurocirculatory asthenia. (44).

Anxiety Factor- Ellis and Hamilton cite cases in their series in which anxiety factors could be found which were not appreciated by the patients. In one case, a surgeon, there was an unsuspected dread of death from a needed but postponed operation; in another case a disturbed marital relationship; in a third, apprehensiveness of breakdown from old age; in a fourth, poor physical condition due to overwork, lack of sleep, and poor exercise; in another, a mother complex with mistaken diagnosis of rheumatic fever fixing the attention of the patient and mother on the child's heart. ⁽²⁰⁾ (This has been noted frequently in the literature as a cause - namely discovery by the examining doctor, of a heart murmur or of history of rheumatic fever prompting him to caution parents of the child to restrict its activities. The parents, becoming anxious, and perhaps overconscientious in their restraint of the child, have caused it to consider itself abnormal physically. Emotional conflicts etc., thereby, are built up, and in adult life manifest themselves in psychoneurotic tendencies, most often of the cardiac type.)

Anatomical considerations

Neurogenic disturbance - The symptoms of heart disease are due, not to the disordered structure or mechanism of the heart itself, but due to the disorder of the circulation. Adequacy of the cir-

ulation is dependent upon many factors:

- (1) Heart - rate, rythm, functional capacity of the myocardium, intactness of the valves.
- (2) Elasticity of the aorta
- (3) Tone of the arterioles, capillaries, and venules
- (4) Arterial blood volume
- (5) Blood viscosity
- (6) Concentration of Hemoglobin
- (7) Ventilating capacity of the lungs
- (8) Action of the striated muscles as a peripheral pump
- (9) Proper functioning of the afferent and efferent nervous pathways to the heart and blood vessels.

Neurogenic circulatory disturbances fall within one of these three groups:

- (1) Disorders due to excessive or exaggerated afferent stimuli.
 - A. Segmental
 1. Somatic
 2. Visceral
 - B. Suprasegmental - cerebral - abnormal mental states
- (2) Disorders due to increased irritability of the visceral nervous system of unknown localization
 - A. Constitutional
 - B. Aquired

1. Infectious

2. Internal secretory

(3) Disorders secondary to neurogenic vasomotor disorders

There is insufficient proof that there are neurogenic disorders arising from disorders of nervous structures of the end organs, ganglionic arc, segmental arc (vagus, sympathetic), or to the hypothalamic arc.(5)

It has been shown experimentally that stimulation of the cardiac nerves will not produce extra-systoles unless favorable circumstances coexist.⁽⁵⁾ Forced breathing has been shown to produce extrasystoles during the period of maximum vagus effect (51). Swallowing has been noted as initiating paroxysms of tachycardia. Other reflex of paroxysmal tachycardia have been mediastinal glands in Hodgkin's disease (23) and insufflation of air to test patency of the fallopian tubes (35). Extra-systoles and transient auricular fibrillation have been observed accompanying gall-bladder disease, appendicitis, and duodenal ulcer, and disappearing following operative treatment of the abdominal condition (54)(22)

Reflex stimulation of the cardiac centers from the brain is a most important cause of neurogenic heart disease. They may provoke extra-systoles and even paroxysmal tachycardia(33)

Anxiety neuroses and varied psychic disturbances contri-

buting to neurocirculatory asthenic picture may be regarded as producing excessive and exaggerated stimuli which reflexly affect the heart through the corticomedullary pathways whose course is still unknown.(5)

Increased irritability of the visceral nervous system is of equal importance to the above. This "autonomic imbalance" is often hereditary and constitutional. Again it often follows acute infections such as pneumonia and influenza; or it may accompany disturbances of the endocrine system as in Grave's disease and the menopause. Symptomatology^Λ much the same except that in the constitutional types they are more persistent and these people are apt to have disturbances of the gastro-intestinal tract, brain, and vasomotor system as well. There are three factors of equal importance that cannot be taken separately:

1. Increased irritability of the extrinsic nervous apparatus of the heart
2. Neurogenic vasomotor disturbances
3. Increased afferent stimuli from the brain.

In discussing them however they are taken up separately to show how each factor works. (5)

Increased autonomic irritability on the sensory side makes the patient aware of the normal heart beat and pulse; this may give rise to palpitation and heart pain. Afferent stimuli

arising from normal functions of the body which in health enable the heart to adapt the circulation to suit the needs of the moment as well as excessive afferent stimuli arising from the associated mental and gastro-intestinal disturbances, give rise to unregulated motor reactions of the heart. In addition there is the dynamic effect of the accompanying vasomotor disorders. In these patients vasomotor disorders are often shown by acrocyanosis.(5) "As a result of the disturbed innervation of the blood vessels, the capillaries and venules in the splanchnic region and in other areas of the body are dilated and a large amount of blood becomes pooled in them. Consequently there often is an inadequate amount of blood in the left ventricle and in the arterial tree. This lack makes itself felt particularly during exercise and undoubtedly contributes largely to the rapid pulse, the dyspnea, and sense of exhaustion which follows physical exertion. It accounts too, for the frequent attacks of vertigo and fainting."(5)

"The patient who develops all kinds of symptoms referable to the heart after an unwise physician has told him that he has a heart murmur and must be very careful of himself, is suffering from overactive cardiac reflexes initiated by his worrisome mind.

"The convalescent from pneumonia, who complains of palpitation, precordial pain, and dyspnea, is suffering from increased irritability of the nervous mechanism of the heart.

"The asthenic individual with cold hands and feet and a long narrow thorax is probably suffering primarily from poor blood distribution due to a disturbed vasomotor control. But it will bear repetition that in most instances all three factors are simultaneously operative."(5)

The most frequent reflex disturbances are those which arise from the alimentary tract. Digestive disorders of any kind are prone to produce such symptoms. (45) Hope made a similar statement in 1846, that the most frequent cause of palpitation of the heart was a disturbance of the stomach.(30). Pelvic disease, especially disordered menstruation is a frequent cause of functional irregularities,(45)(or a result of it?)

Normally there is an "adaption reflex" in which nature utilizes the nervous control of the heart and blood vessels. Exercise calls forth a physical and chemical response, and emotion calls forth a nervous response (7). It is this response, exaggerated by and over-reaction to the emotions that gives rise to symptoms of cardiac neurosis.

Cardiovascular disturbance - There seems to be a "psychic constellation" related to the spasm of the vessels and other musculature and body systems simultaneously, no matter what the organic basis.(17) Whether one thinks in terms of a vasomotor diathesis, or of a

primary disturbance of the vascular mechanisms because of a neurosis, one may expect the following phenomena: (17a)

(1) Involving preeminently the capillaries there are active hyperemia (various types of erythema including blushing); spasm and anemia (pseudoanemia, Voldhardt's pale hypertonics); paralysis plus stasis (acrocyanosis); paralysis plus spasm (marble skin); hyperemia plus exudation (urticaria).

(2) Involving primarily the small vessels, are: Pal's crises, migraine, vasomotor angina pectoris, abdominal angina, intermittant claudication, Raynaud's disease, pseudo-apoplexy, hypertension, etc.

Conscious concentration of attention on a part of the body may alter it physiologically to some extent. A concentration of energy or libido which takes place unconsciously has been demonstrated to be potentially more effective. (17a)

Emotions, such as described above, cause changes which, at first, are reversible, but long continued spasm of a tubular organ leads to muscular hypertrophy of superior parts with secondary dilatation; this change is irreversible and it is then known as an "organic" lesion. "The affected organ may represent very different things to the patient's unconsciousness. What happens within the organ will depend upon the related unconscious phantasy. An important point here is whether the symptom satisfies primarily

a desire for pleasure or punishment.....in other words against what impulses the ego is thereby seeking defense," (17a)

Pathological disturbance - Lewis, in his investigation of soldiers with "Effort Syndrome" during the war made the following observations on general pathology.

1. Nervous system - Hyperexcitability of the central nervous system appears to be very general;"witness the usual and conspicuous exaggeration of knee jerks."

- (a) The vagus. The action is not normal as shown by the effect on the heart rate in its delay to regain control and slow the pulse after exercise. Also shown by the exaggerated irregularity of heart action accompanying deep respirations. A final manifestation is the production of occasional profound slowing of the heart and reduction of the strength of its beat leading to faintness and syncope.
- (b) Accelerator nerves - Overaction of these nerves causes the exaggerated response of the heart rate to emotion and exercise. Fraser and Wilson concluded from their observations upon apocodeine and adrenalin, that the sympathetic system is hyperactive. Not clear whether the nerve terminations or the tissues they supply are at fault. (39)

2. Hypothesis of hyperthyroidism - no proof. He does not believe that there is much basis for this theory.

3. Possibility of a myocardial factor - There is a high incidence of rheumatic histories in these patients. It is possible that there has been damage, not yet demonstrable, due to the infection, and that irritability of the heart is an initial manifestation. One sign, he noted, that was of conspicuous value as indicating myocardial injury was an increase in the interval between contractions of the auricle and ventricle, and in patients who have this predisposition, it may be brought out by exercise. Parkinson made electrocardiographic studies on ten of the most likely subjects, and failed to demonstrate this point. He stated that it was improbable that any early myocardial change played much part in the production of effort syndrome.

4. Hypothesis of bacteremia - Blood cultures failed to demonstrate any evidence of this. Assumed that blood infection plays no part in the affection.

5. Hypothesis of toxemia - It was conceived that the symptoms could arise not by poisoning engendered by infectious disease, but by the products of faulty metabolism brought about by the disease process. Strongly favoring this view were observations on changes in the constitution of the urine, and more emphatically, changes in blood chemistry.

Toxic substances and infection

All of the writers agree that infection plays a part in acting to alter the constitution of the patient so that other factors of strain and emotional disturbance can more effectively act to bring out a latent neurosis. Of the chronic infections, tuberculosis is the most important. Of the acute infections, influenza and pneumonia predominate. Most writers believe, however, that infections of this type do not play their role without the aid of hereditary and constitutional weaknesses, environmental factors, etc. found lurking in the background of the psychoneurotic reaction type.

Lewis (39) in his report states that infection is the predominant etiological factor in effort syndrome.

Infection plays a dual role. (1) It plays the chief part in promoting the disease in its initial stages and (2) in patients who have already acquired the condition, serious intercurrent maladies almost always, and mild infections often, increase the severity of symptoms. In 314 patients in whom the immediate cause of the onset was uncertain, at least 50 were first invalided to hospital for infectious diseases which were found, during convalescence from the intercurrent illness, to have aggravated the symptoms; a larger number gave histories of similar infections aggravating the symptoms at more remote periods.(39)

Ellis and Hamilton(20) state that the symptoms are the same whether there was no apparent cause or whether it followed pneumonia, rheumatic fever, trench fever, battle wounds, shell shock, drunken debauch, or emotional factors.

Toxic substances of tea, coffee, tobacco, and alcohol in regular or irregular doses may act to render the heart more sensitive to the emotional struggle.(26)(21)

Hope, as mentioned earlier in this section, mentions the swallowing of tobacco juice by malingering soldiers to bring on severe palpitation.

Parkinson, in Lewis's report made observations on 20 patients with 10 controls. In patients and controls the pulse and blood pressure rose as a result of smoking, but the reaction was somewhat greater in the case of the patients. The reaction to tobacco was similar in patients and controls, but the degree of reaction was somewhat greater in the patients."Tobacco smoke exerts a deleterious influence, temporarily at least, in that it enhances the resting pulse rate, increases the reactions of the pulse rate to posture and exercise, and increases the prominence of symptoms produced by exertion." (39)

Constitutional Factor

Many patients present clear evidence of constitutional

inferiority. They are often undersized, underweight, visceroptotic show various evidences of vasomotor instability, and inability to adjust themselves to their environment or to meet emotional crises Often there is a hereditary trend. (54a)

G.M. Campbell gives three types of constitutional inferiority in his classification: (8)

1. Inferiority manifested in prolonged physical invalidism with little or no definite intelligence defect

2. An inferiority in which defective intelligence is a prominent factor.

3. An inferiority in which the instinctive and emotional life is of poor quality while the intelligence is fair.

Psychic Factor

1. **Emotions** -"In view of the demonstrated reactions of the mind to conditions of environment, used in its broadest sense, it appears justified to connect them with the heart disorders which occur so frequently with the emotions as the etiological factor. From work done by psychologists and psychiatrists it seem justified to point out that it is an unhappy status of mind due to unfulfilled desires and conflicts that sets the stage or donditions the onset of cardiac disturbance, as one way of escape from unhappy situations, or as an offensive in the accomplishment of a much desired objective "

(26)

"The accomplishment of some desire may require building an offensive over a long period of time and then the neurosis becomes a substitute, an explanation, and an asset"(Casamajor)(26)

Braun has shown that a thorough study of the relation between the heart and mental life is necessary. He introduces the concept of the cardiac psyche of which the essential mark is anxiety. He calls the heart the "specific sense organ of anxiety". Anxiety is one of the three fundamental drives of life, the other two being hunger and sex. He says that anxiety is an "inner tactile sensation bound up with special end apparatus", located in the cardiac tissue, which is well supplied with special end apparatus of the sensory nerves. This he called primary anxiety. He distinguishes it from secondary anxiety, which he described as distinct from this primary or direct sensation, being a "psyche reverberation" causing various effects according to the constitutional type of individual. All anxiety shows at least an irritability in the specific cardiac end organ.(18)

According to W.H. von Wyss:

"Psychic processes, especially the emotions, have a bodily resonance, and vice versa, bodily processes have a psychic resonance. In other words an affect contains not only its psychic experience, but also its motor expression to the outer world, and the resonance in the viscera, this latter representing a sort of language of the individual to himself. Since circulation is that function, the cessation of which means instantaneous termination of life, the heart has

become one of the most important organs of inner expression. It is for this reason that the heart has such close relationships with the emotional life, and has become the symbol of what is really individual in man, the symbol of his virtues and vices. It is the study of these relationships which brings us to the borderland of our knowledge, to the question of what, in the last analysis, binds the psyche and some together into a unity."(18)

G. Klempner believes that a lasting emotion may eventually disturb a previously healthy heart to the point that it may ultimately threaten life. Hypertension and arteriosclerosis can be placed on such a psychogenic basis. Coronary spasm can be of psychogenic origin. "Contraction of a small coronary vessel over minutes leads to localized anemia and ~~weakening~~ of the vessel wall; when the contracted vessel opens again, a hemorrhage may result. We are justified in assuming for the heart which Westphal has anatomically proven for the brain. Professor Jaffe demonstrated myocardial lesions of a chronic inflammatory nature at autopsy, that could not be explained on the basis of thrombosis or embolism." Psychogenic cardiac death can be regarded as an established fact according to G.R. Heyer. Sudden death after emotional shock in organic heart conditions is an everyday occurrence. H.E. Hering found, on the basis of twenty years' animal experimentation that a tendency to sudden death in chloroform narcosis is related to a state of excitement in the animal. (18) (Note: Pharmacologists

give the following explanation. During the excitement stage the animal holds its breath, chloroform becomes highly concentrated in the mask, then when animal breaths in the highly concentrated vapors, circulatory failure ensues. Explained on a toxic basis)

L. Alkan sees the chief danger of narcosis in fear of suffocation resulting in excitation and angiospastic increase of peripheral vascular resistance, against which the heart may fail.(18)

Transitory changes in heart rythm in emotional conditions are common but there may also be long lasting changes. (18)

G.W. Darrow finds:

1. Reflex responses to momentary sensory excitation differs from response to ideas aroused by the stimulus, and both of these reactions have been called "emotion."

2. Momentary stimulus is more effective in exciting peripheral changes. Ideas are more effective in increasing cardiac activity.

3. Exceptions: (a) Disturbing ideas leading to depression may slow the heart. (b) Tastes and smells usually increase rather than decrease the heart rate. (c) Continued prolongation of sensory stimuli is likely to increase the heart rate. (d) Fright and startle after sensory stimulus are likely to increase the pulse rate preceeding the characteristic slowing.(18)

The emotions act by unknown processes to cause activity of

the involuntary nervous system and become manifest in one of three levels as L. Brown has described:(26)

1. Psychical with obsessions
2. Sensory-motor with paralysis, contracture, tic, and anesthetics
3. Visceral with various vegetative neuroses.

Dr. Cannon has shown that many changes of internal chemistry accompany the external evidences of emotional conflicts.(26) But in whatever way the sympathetic system is brought into action it "simulates the ordinary expression of certain emotions - pre-eminently the emotion of fear - tachycardia, palpitation, sweating, blanching, of the extremities, and gastrointestinal disturbances"(26) **Fear-** Of all the emotions serving as a background stimulus for the development of a cardiac neurosis, fear is one of the most common(31) Any circumstance which sufficiently excites fear, especially in relation to the heart, may be the starting point of a cardiac neurosis.

According to Halsey, psychoneurosis is based on an unconscious fear or repressed fear. It is shown whenever the personal resistance is lowered by disease, emotional shock, or psychic conflict when "our equanimity is impaired." (26)

The emotional reaction itself is not as important a con-

sideration as the factor which causes its prolongation . According to Ross, fear of the symptoms of heart disease is one of the most important causes of its prolongation to the extent that it becomes an illness. (49) The patient may be timid and get heart palpitation and believe he has a weak heart, from what others tell him, or from what the doctor has told him; therefore everytime he gets frightened or worried his heart pounds and everytime his heart pounds he becomes frightened - thus a vicious circle is established. The patient may be told that there is nothing organically wrong with his heart but he feels palpitation and feels that the doctor and others do not understand and therefore he passes into a state of despair which causes more palpitation.(49)

Another view of the action of fear is that of a conditioned reflex. Since there are abnormal fear reactions it may be assumed that they may be conditioned to respond to abnormal stimuli also. One may be "sensitized to fear" by worry or stress and strain of some type. "Conscience is nothing more or less than social fear. An overburdened conscience, remorse, or a compensation for an inferiority, is cumulative in its effects upon the person's fear responses. Frustration, ethical conflicts, and worries of any sort can accumulate until some cardiac or other fear reflex attracts the person's attention." Symptoms recur as his thought

trend may be directed toward his fears or his symptoms. "He does not need a libidinous frustration to account for his symptoms and his fear can account for his failing libido, Freud notwithstanding" (1). Reflex symptoms in some may be manifest as hypertension, rapid pulse, and pseudoanginal pain. When these, or other anger symptoms come to their own attention as abnormalities, there is another resentment and frustration for them to cope with and sooner or later fear and increasing introspection hold sway. (7)

Anger - Anger is another emotional reaction acting to promote neurosis, especially repressed anger, which, according to Cady, is capable of causing pain under certain circumstances. The narcissistic or aggressive but emotionally underdeveloped person may have a hidden conviction of their shortcomings outwardly manifest by paranoid enunciations of something outside themselves. When their symptoms come to their attention there is another resentment and frustration for them. This furthers their symptoms etc, etc.

The initiating factor causing onset of neurosis

The relative importance of the predisposing factors and heredity, family background, environment, occupation, infection and the initiating factors bear a definite ratio. The greater the predisposing factor's influence, the smaller and more insignificant need be the the initiating factor.

The initiating factor is usually something commonplace and unnoticed by the ordinary individual, such as awareness of the heart beat, recurrent heart consciousness, and uncertainty. With the initiating factor there is a decrease in the nerve threshold bringing on the symptoms of cardiac neurosis.(58)

C.M. Campbell compares the predisposing-initiatory reaction to anaphylaxis. Every experience, he states, tends to modify the later reaction of the organism; after infection a patient may have an increased sensitivity so that he may have an anaphylactic reaction with infection the next time. Patient may have an experience which may sensitize him to a very minor related experience the next time. This has been noted in wartime soldiers having been subjected to terrific explosions on the battle field becoming highly reactive to small noises later. The stimulus reproduces in kind, if not in degree, the original reaction. Anything that tends to reactivate the memory of the initial painful experience may have a disturbing influence on the vegetative nervous system, without consciousness necessarily being aware of it. (8)

In the war the precipitating cause was most often linked up with fear. In civil life the same hereditary constitutional factors are present but the precipitating cause is linked with anxiety and emotional strain.(38) Strain is important as a provocative cause, bringing out latent symptoms in one previously

untested, displaying a dormant, or partially developed defect.(39)

Experimental work

F. Deutach and E. Kauf comment that although changes in pulse rate and blood pressure, as they are produced experimentally in hypnosis by suggestion of an experience arousing anxiety, are clinically well known in nervous people, the development and continuation of the symptoms is not yet sufficiently explained. They set out, for this reason, to show experimentally that ideas and experiences accompanied by anxiety originally but long since forgotten, cause cardiovascular disturbances. (18)

An experience no longer in consciousness may produce the same sensations as at the time of its happening. The majority of cases gave experiences they believed to be responsible for their difficulties, and it was found to be not the real etiological factors;"an experience which is repeatedly remembered and is conscious becomes abreacted, loses its effect, and, in consequence, its power of reproducing somatic effects." These authors conducted the following experiments in hypnosis to illustrate the above.

"An exciting experience was suggested to the subject in hypnosis with the simultaneous suggestion of complete amnesia for it. Furthermore the post-hypnotic suggestion was given that with a certain signal(seemingly accidental showing of a handkerchief) the subject would have the same sensations as during the experience. When, after hypnosis, the handkerchief was shown, there was in all cases a definite increase in pulse rate (maximim 27 beats

per minute) similar to that during the suggestion of the experience in hypnosis.

"Two subjects were given, in addition, the suggestion that on the dropping of the handkerchief they would remember the experience completely. Whereas on the production of the handkerchief there were pulse accelerations of 15, 12, 13 beats per minute in one case, 22 and 27 in another, repetition of the stimulus after dropping the handkerchief produced no, or only negligible acceleration. In one case there was intense anxiety with recollection of the experience." (18)

General Symptoms

According to W.B. Newcomb these patients of cardio-neurosis present a "profusion of symptoms and a paucity of signs" Their descriptions follow a fairly definite word patters as - "fluttering of the heart," "felling of fulness," "sense of pressure," about the heart, and pain.(45) Mimicry of symptoms is now more exact because of propaganda etc. thru the radio. (27)

Those symptoms of a more general nature are: weakness, fatigue, insomnia, choking sensations and sternal oppression, and ache in the region of the heart. But in spite of all their trouble their strength and vital capacity is normal.(44)

Patients with functional disorders may have many other symptoms than those related to the cardio-vascular system. (7)

Anxiety dreams and anxiety

A. Kardiner and Eichenberger found that in cardiac patients there was a definite increase in anxiety dreams coinciding with beginning cardiac decompensation. T.P. Wolfe made similar observations in patients with rheumatic heart disease who reported no anxiety dreams during compensated phases but numerous anxiety dreams of a more or less stereotyped nature during a recurrence.(18) Lewis noted anxiety symptoms in his wartime series.(39)

Lewis noted

Miscellaneous general complaints - Fatigue, nervousness, and swelling of the feet (a complaint of the introspective)(18) palpitation (to be taken up separately) prepordial aches, and exhaustion (11) symptoms referable to other organs (54a). Some patients have a position aversion - they find they cannot sleep or rest in certain positions (61)

Pain

Pain is one of the chief symptoms of these patients.

1. **Type of pain** - grades from merely an uncomfortable sensation or heart consciousness to a stabbing or pinching pain, sometimes very severe.(20) The dull aching type of pain is not referred, is limited to the precordial area, and patient is relieved by lying down.(44). The pains are usually apical and on the left side rather than substernal as in true anginal pains(49) The pain is more apt to consist of twinges of darting pain rather than the steady boring constricting pain of true angina. The neurotic attacks are rarely produced by physical effort, but more often follows emotional stress.(45)

According to Hill, heart pain, when functional, may be understood to symbolize pain in the "sphere of love life." Frequently these functional pains are quite accurately descriptive of the patient's emotional difficulty, as when his heart feels

that it is bursting or as if being squeezed in a vice.(28)

2. Radiation of pain - The more severe the precordial discomfort the more likely the radiation. It may radiate to the left arm, axilla, shoulder, or scapula. In 33 of 74 of Craig's and White's cases this was true.(11)

3. Angina pectoris- Conner says, in reference to angina pectoris "contraction, overdistension, pressure, and pulling, cause pain and the result is very similar whether these conditions are brought about by local or organic disease or by overaction of the sympathetic system under the drive of the emotions."(18)

G. Recht and K. Fahrenkamp find the greatest difficulty in diagnosis of angina pectoris is met in the case of physicians who think they are suffering from the disease. Neurotic breakdown of physicians between forty and fifty so often takes the form which the patient himself designates as angina pectoris. (18)

W.R. Houston thinks that there is a "spasmogenic aptitude" which must be present to evoke spasm with its characteristic pain. He finds this syndrome lacking in the Chinese. (A Chinese doctor at his request analyzed the records of 24,884 Oriental patients over a period of seven years, finding a spasm of unstriated muscle in about 1 per 1000). The tendency to speak of true and false angina is attacked by P.D. White as follows:"In the first place it is always a real, and not an imaginary pain.....secondly, it is fre-

quently impossible to be sure of the presence or absence of important pathology like coronary disease; and thirdly it adds a degree of optimism or pessimism that is unjustified." He says that in patients dying during an attack very little is found post-mortem while on the other hand extensive aortic and coronary lesions are frequently found without any history of angina pectoris. He also points out that with increased strain of modern life, this condition is becoming more frequent, allowing of course, for possible diagnoses in the past, that have been missed.(18)

Fahrenkamp rejects the differentiation of angina pectoris vera and falsa saying that there are intravital, all possible transitional stages from the slightest disturbance of function to the gravest pathological-anatomical changes of the coronary vessels. He noted that some attacks occurred during motion and others during sleep. In all cases, next to physical exertion, psychic excitement is most likely to produce an attack. Cases in which attacks come on at definite times or in definite places are cases showing a tendency to dissimulation. Such occurrences point to an unknown psychic fixation. Even a patient not neurotic will develop an anxiety following his first attack. He believes that the psychic attitude of the patient with angina pectoris is sufficiently explained by the attacks and pains and does not call for an explanation in terms of psychopathology. From a therapeutic standpoint, there is

no group of patients in which the psychic factor is more important. Heyer says that actual angiospasm as a symptom of angiospasm occurs; the anxiety then seems justified and increases again, etc.(18) Hope (1846) thought that angina was much the same type of pain as tic doloru and sciatica - a neuralgic type of pain.(30)

4. Differential diagnosis- Luetic heart disease, coronary sclerosis and acclulsion have pain, but the vast majority of patients suffering from this complaint have no structural disease of the heart. It is important to take a careful history in regard to what initiates the pain, its location, character, duration, radiation, and the patient's behavior during the attack. In favor of organic origin are its consistent onset after exercise or heavy eating; location behind the sternum; pain of squeezing, crushing nature, radiating down the left arm into the neck, or more rarely into the abdomen; duration of 5 minutes or more, rarely over ten or 15 minutes except in coronary thrombosis; and a very real fear in the patient which manifests itself by almost immediate cessation of all activity. Usually they sit down right where they are. These findings may not be consistent, however, in either the neurotic or organic disease. Postive electro-cardiograms are of great help.

Vertigo and Syncope

This finding is fairly constant. Most of the writers mention it in passing only, however. It is a finding to be expected in this type of individual and especially in a cardio-neurotic.

Respiratory difficulty

All the authors agree that a "sighing respiration" is practically pathognomonic of this condition - providing of course that there are no other findings of particular significance. In true organic disease, however, the respiratory effort is a true dyspnea, and not this type of respiratory difficulty.

This sighing respiration is described as a difficulty in taking in sufficient air - patients complain of inability to take a deep breath(3). Dyspnea is much less frequent (54a). The type of "dyspnea" noted in these patients is brought on more by emotional upsets than by exertion.(61)

Hill, in his discussion of Love's paper says that sometimes this shortness of breath is found to express the patient's unconscious terror of sexual acts which are characterized by heavy breathing, and again the symptom frequently resolves itself into "fear of death, of not being free, of an inability to do anything which will relieve tension.....Such frustration and fear causes

a feeling of rage."Repressed rage will further the symptoms.(28)

Ellis and Hamilton noted that in soldiers they became breathless on slight exertion and spoke of a sense of suffocation. Tachapnea was the rule, even at rest.(20)

Nesbit gives the following description. The dyspnea is usually subjective, a conscious respiratory effort with lack of relief by rapid breathing and with a feeling that respiratory efforts are inadequate. Their frequent sighing to obtain relief is often done consciously, which is one of the chief characteristics of neurocirculatory asthenics. They may have a true tachapnea up to 100 or more, a condition not found in organic heart disease. This indicates a disturbed vasomotor system. (44).

Lewis, in his wartime cases, found one case which showed a remarkable respiratory rate of over 200 per minute for a considerable period. In 26 patients who complained of no breathlessness at rest, the average percentage of carbon-dioxide in the alveolar air taken by Haldane's method was 5.6. The estimates were made after the patients had rested for half an hour. The carbon-dioxide content of 18 of these patients who complained of considerable breathless on exertion was not notably different. The percentage of carbon-dioxide in the alveolar air of these patients was within the lower limits of normality, in contrast with the carbon-dioxide percentages in patients suffering from cardiac

failure. In the same series the time during which the breath could be held (average at end of inspiration and expiration) was ten seconds, a very short period. Normal is thirty seconds or more. Air mixed with various percentages of carbon-dioxide was breathed by these patients and the lowest percentage producing the slightest hyperpnea was ascertained. The normal individuals gave a percentage of 5.6 whereas the patients gave an average of 4.8. All of this work was done by Drury. (39)

The cause was explained by Lewis as that these people have an intolerance to carbon-dioxide. The reason for this intolerance is a deficiency of buffer salts in the blood. Experiments on carbon-dioxide combining power lead him to conclude that the patients blood was less capable of taking up carbon-dioxide in loose chemical combination than is normal blood. The buffer salts being reduced, the natural liberation of acid produced an undue change in the blood's reaction and a corresponding stimulation of the respiratory center.

Palpitation

This symptoms is found by all authors to be the most common complaint of cardio-neurotics. It is due, exceptionally, to the presence of premature contractions or extrasystoles. The symptom complained of by the patient is an occasional uncomfortable feeling

in the chest as though the heart had turned over or "thumped against the chest wall." This appears mainly during rest after exercise.(39)

Continuous palpitation is much more common. It may be maintained under all conditions but more commonly it is present or severe chiefly during exercise or under emotion. (39)

Palpitation may come on when the patient is lying awake in bed and while thinking or brooding.(49)

Objective Symptoms

The signs mentioned in the literature include the various arrhythmias, murmurs, sighing respiration, heart size, heart rate, cyanosis, cold extremities, perspiration, blood pressure, electrocardiographic and basal metabolic determinations.

Arrhythmias - Sinus arrhythmia, extra-systoles, paroxysmal tachycardia and auricular fibrillation were all found by Levine.(38)

Extrasystole- In Wenkebach and Winterberg's series 55% of 278 patients with extrasystole showed no pathological change. They classified them as; 1. Those who became nervous because of extra systole, and 2. those who suffered from extra-systole because of their psychic makeup.(18)

Paroxysmal tachycardia- G.R. Heyer and W.H. von Wyss noted that a vicious circle was established in this arrhythmia. The tachycardia

was brought on by emotional factors, this attack produced additional psychic shock, and a vicious circle was thus established. (18)

Ellis and Hamilton found that during the war many of the patients had heart rates of 150 or more persistently with a pulse slow to return to normal after rest. (20)

Murmurs - All writers agree that the murmur is a soft systolic murmur heard best at the apex. An unprejudiced analysis of systolic murmurs was carried out by Lewis' commission and he came to the following conclusions; "The presence or absence of systolic murmurs is of no value in estimating the soldier's capacity for work; this practical conclusion holds irrespective of the character, conduction, or point of maximal audibility of the murmur in question." (39)

Systolic murmurs are usually inorganic and arise in the venous trunks, aorta, pulmonary artery or at the arterial and venous orifices and not within the heart itself. (41)

Levine is less inclined to dismiss systolic murmurs as being functional alone. He says that systolic murmurs of "greater than the faintest intensity" deserve investigation. They may be important clues to diagnosis of an otherwise unsuspected hyperthyroidism or bacterial endocarditis. They may indicate early rheumatic involvement. When all associated conditions can be

ruled out and the systolic murmur is still heard it may then be assumed to be a "benign systolic murmur." (38)

According to Love, systolic murmurs at the apex are not sufficient evidence for a diagnosis of heart disease and that too much emphasis laid upon them, especially if the patient is given any indication of what the doctor has found, will lead to anxiety on the patient's part that will be harmful. (40)

Systolic murmurs over the apex or pulmonary area are found in 20% of normal persons (32).

Heart size - The average heart size, estimated by the transverse diameter, in the patients in Lewis investigations, was somewhat less than the average size in healthy young adults examined in similar circumstances which may be accounted for in two ways: 1. In the patients their heart rates were accelerated and in acceleration of the heart its size is decreased. 2. The measurements of the hearts were taken to a great extent in subjects whose former occupations had been sedentary in nature. (39)

Cyanotic cold extremities,--and excessive perspiration

Viko, Ellis and Hamilton, noted that most of these patients showed cold extremities that tended to be cyanotic. (20)(54a)
These observations fall in line with the general vasomotor instability as seen in these cases.

Excessive sweating in the patients is frequent and at time leads to complaint. It is frequently noticed in the palms of the hands and soles of the feet while the patients are at rest and it is a common experience to note sweat drops trickling from the axillae while patients stand stripped in a cool room. Mild stimuli, such as easy exercises or emotion, may produce conspicuous sweating of the forehead and body. Salivation, judged from the rate of swallowing while at rest also appears to be increased amongst them. The effect of pilocarpine in causing sweating, salivation, and lachrimation is more pronounced in these patients than in normal persons. This serves as a basis for the belief that the excessive sweating etc. can be explained as one of hyper-excitability of the peripheral mechanism rather than of the central nervous mechanism. (39)

Blood pressure - The blood pressures in patients at rest are rarely more or less than normal. Relatively high systolic pressures are frequent if the patients are examined while up and about. The maximal systolic blood pressure reached after cessation of test exercises is, on an average, a measure of the actual distress produced by exercise. (39) The blood pressure may be sub-normal in many instances but the most notable observation is that the blood-pressure rapidly fluctuate in the individual over short periods of time. (44)

Of all the psychosomatic interrelationships, those relating to the blood distribution and blood pressure were subjected to the earliest and most extensive studies. Weber's book is a standard work. He reviews older literature of Wundt, Lehman, Berger, Ninet, Darwin, Dumas, Gent, Brahn, Mosso, Lange, Binswanger, etc. etc. Among the most important findings of these earlier studies was the inverse blood distribution in limbs and body surface on the one hand and the viscera on the other. The pathological effect of long-continued psychic and emotional stress is well exemplified by essential hypertension. Although this disease has no demonstrable etiology from an anatomical standpoint it leads to demonstrable changes, particularly arteriosclerosis(Alkan)(18)

Electro-cardiographic changes - Lewis found no significant change(39)
Graybill and White in 1935 made the following observations: (24)

1. Group consisted of 7 patients, 3 males and 4 females with an average age of 24. Not a single case was organic disease of any description found on repeated examination.

2. Symptoms - palpitation, easy fatigability, dyspnea, etc. as in neurocirculatory asthenia.

3. Inverted T waves were first seen in leads II and III and after improvement only in III. Heart rates varied from 75-100 with an average of 88.

4. Apparently there is no relationship between this finding and neurocirculatory asthenia since it is rare.

5. "Although it is a very occasional finding, inversion of the T wave retains importance because of the serious diagnostic error to which it may lead" in these people. (

6. The T wave is much less stable than other cardiac deflections. Although its mechanism is obscure, there are certain secondary factors which may change its form and direction; the action of toxins and drugs; and change in position of the heart. Inversion of the T wave in leads I and II is by no means invariably allied with causes commonly held to produce such inversion. (24)

Basal Metabolic rate

Rates of plus 20-30 have been found in the tension states of psychoneurotics (6). Most of the authors state that the BMR is within normal limits.

Diagnosis rests upon the peculiar nature of the symptoms but does not depend upon the exclusion of organic disease. (20) Graver disorders in addition to psychoneurotic manifestations in cardiac patients must be kept in mind (28)

A diagnosis of cardiac neurosis should be made only after a complete history, physical examination, and graphic records (if available) have ruled out other possibilities, and then only reluctantly (48)

Symptoms and signs should be carefully evaluated but a diagnosis should be positive when made (38)

Murmurs - Differential diagnosis

Functional murmurs - systolic, pulmonic, and in mid-sternal line. They are variable and in different positions. Murmurs in the absence of cardiac hypertrophy and history of significant infection with normal functional tests should be carefully evaluated before making diagnosis of any serious condition. (45)

Palpitation - Nervous palpitation as distinguished from that of heart disease occurs only occasionally. It is not excited, but relieved by exercise which would certainly disturb a diseased heart. Nervous palpitation has a disposition to supervene when the patient is at rest, and is exaggerated by exacerbations of

nervous disorders.(30)

There are four diseases of the heart that should be considered carefully in patients presenting the type of symptoms seen in cardiac neurotics, namely: (a) Coronary disease and coronary thrombosis (b) Cardiac infarction (c) Hyperthyroidism, and (d) pulmonary tuberculosis.(21)

Hyperthyroidism

The more prominent symptoms of a toxic thyroid are:

1. Tachycardia
2. Nervousness, irritability, and tremor
3. Loss of weight and strength
4. A goiter
5. Exophthalmus and stare
6. Elevated BMR

Tachycardia - This is persistent throughout the day and night in hyperthyroidism. In the neurotic, it is lower at night - they are more the type to exhibit an erratic pulse. The blood pressure of a neurotic is rarely above 110-115 with diastolic of 80, while in thyrotoxicosis, there is an increased pulse pressure. Persistent tachycardia in the presence of an increased pulse pressure is probably hyperthyroid.

Nervousness, irritability, and tremor - "The neurotic speaks rather

boastfully of his long-standing nervousness" but outwardly does not show the agitation and nervous mannerisms of the hyperthyroid. Neurotics often prepare a long list of complaints carefully compiled so that none might be forgotten.

Tightness in the throat, etc. is complained of in a goiter only when the size of the goiter warrants it, whereas in the neurotic it is present whether there is a palpable goiter or not.

Loss of weight and strength - In the neurotic is due to poor appetite. In the hyperthyroid, due to increased burning of food. Weakness is subjective in the neurotic and objective in the thyrotoxic. This applies particularly to quadriceps weakness.

Therapeutic test - Lugol's solution will show improvement in the hyperthyroid whereas it will do no good in the neurotic. (6)

The most dependable guide is the basal metabolic rate. The onset in the neurotic is never as definite, and the history extends back over a long period of time, whereas in the thyroid case the onset is usually more sudden and definite. Also, in the neurotic the heart symptoms are out of proportion to the rest of the findings. In a hyperthyroid with corresponding symptoms regarding the heart should show (a) Greater nutritional disturbances (b) Higher BMR (c) Greatly increased appetite (d) more active

type of nervousness. In the neurotic, the nervousness is more of the listless, complaining nature. Tremor in the hyperthyroid is finer. The hyperthyroid "bombs his illness" while the neurotic "submits to it." (46)

E.P. Boas and E.F. Goldschmidt made cardiometer heart rate studies and found that the sleeping rate in Graves disease was 30 beats greater than the rate of the average individual. In neurogenic sinus tachycardia the heart rate shows marked reduction during sleep, but not to as low a level as in the normal person. (18)

Organic heart disease and cardiac neurosis

The victim of a neurosis shows fright or emotional anxiety while the true sufferer presents an aspect of true physical distress, being gray or pale, often dripping with perspiration, breathing slowly and irregularly, the pulse not being quickened or irregular but slowed, difficult to feel and of small volume. (52)

We must be certain to exclude organic disease, since it might be disastrous to make a mistake between angina and pseudo-angina; painless coronary occlusion; functional and hyperthyroid tachycardia. It might be disastrous to treat heart block if functional also. (7)

Diagnosis of a cardiac neurosis is difficult since it

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based on negative rather than postive findings.

Summarizing the most diagnostic symptoms are:

- (a) Sighing respiration
- (b) Palpitation
- (c) Heart pain and hyperesthesia of precordium
- (d) Fatigue with slight effort.

Incidence

J.C. Edwards and P.D. White analyzed 5000 consecutive cases - of these 13% were neurotics.(19)

Uncomplicated by organic disease.....65.2%

Complicated by organic disease.....19.6%

Doubtful organic disease.....15.2%

Of those complicated by organic disease

Rheumatic heart disease.....44.4%

Coronary disease.....21.4%

Hypertensive heart disease.....18.0%

The Psychic Factor in Organic Disease

The relative importance of psychic and organic factors depends naturally upon the seriousness of either condition. If the organic factors are at all serious, the psychic factors should be disregarded until the patient is treated for the organic condition.(10)

Neurosis complicating Organic Disease

When Neurocirculatory asthenia complicates organic heart disease the symptoms are essentially the same in character and quality as they are in the absence of organic disease.(11)

Diagnosis of this condition is made by the disproportion between the organic findings and the symptoms. Improvement or regression of the symptoms is dependent upon emotional states rather than physical exertion. The cardio-neurotic welcome restriction of his activities while the organic heart sufferer will resist restriction. The mental reaction to the lesion is worse than the lesion itself. (61)

The basis for therapy is to point out the background of the patient's disturbance and teach the patient to approach the problems facing them on a common sense basis rather than a symptom complex. It is possible to change a patient's attitude towards a situation when the situation itself cannot be changed.(17)

Cardiac neuroses are so wide-spread as to demand careful consideration and a sympathetic attitude rather than a belittling one or one of contempt.(58)

A helpful hint in talking to these patients is mentioned by W.D. Reid. He says that the doctor must watch his facial expressions while talking to the patient or it will be his undoing. Since these patients are ready to believe that no one appreciates their illnesses, they might easily be disturbed by any appearance of impatience or disgust that might creep into the doctors expression. (47)

It is neglect of the proper treatment of these cases that fosters quackery. Hirschboeck claims that 60% of medical practice is made up of the "functional" type of patient. (29)

It is much easier to recognise the importance of psychic factors than to deal with them.(10) A common sense approach is sufficient in most cases. Psychotherapy is seldom necessary and should be attempted only by those schooled in its methods.(18)

. Use of Stimulants - Some writers claim that the use of stimulants should be stopped, such as tobacco, alcohol, coffee, and tea. most of them agree that excessive use of them should be curtailed but that they should not necessarily be stopped.

Exercise, training, and occupation - Lewis' army routine was as follows: (39)

1. In convalescents - gradual transition from hospital to the training depot.
2. Cleaning up of foci of infections, since infection aggravates the symptoms.
3. Period of rest from drill, but rest in bed harmful
4. Occupation
5. Occupation
 - a. Gives exercise
 - b. Controls introspection
6. Avoidance of any suggestion that the heart is affected.
7. In postural giddiness or giddiness at cessation of exertion, a tight abdominal binder helps.
8. Drugs good only for INITIAL SEDATION
9. Dietary alterations and physical therapy is of no avail

Writers all agree that exercise within the individual's

limits (not supposed but actual limits).

Discussion and Explanation

This is another of the generally agreed-upon points by all the authors, namely that the condition should be carefully explained in words suited to the general intelligence of the patient, and repeated as often as necessary. The background for the development should be brought forth, since, as mentioned in discussing etiology, the cause is often lurking in the sub-conscious mind and requires much diligent search to bring it out. It should be explained that the symptoms are due to emotional causes rather than due to disease of the heart itself. (52).

Environmental factors need to be explained and changed if possible, or the patient's attitude toward them needs change. (59)
(49)(58)(31)

Local treatment

Refractive errors, gynecological work, foci of infection etc. should be done if indicated but this alone will do but very little towards helping the real condition. Usually the physical conditions causing neurosis is always trivial. Such things as (a) displaced uterus, (b) nasal spurs and deviated septa (c) small astigmatisms, (d) mild infections, etc. are found but their correction does very little good, and are temporary only.

Psychotherapy - as stated before, is seldom necessary and if it is used it should be placed in the hands of a competent psychiatrist (18)(20)

Drugs - Most writers recommend mild sedatives only early in the treatment, in order to get rid of insomnia and promote healthy rest, but the indiscriminate use of drugs is very much to be avoided, since the patient relies upon them more than upon the doctor or himself.

Quinidine- is used if arrhythmias such as paroxysmal tachycardia and extra-systole are especially annoying.(58)

Glandular substances- Naturally this creeps into every treatment of practically every disease ever heard of. These drugs have their place, but it is the general belief that unless evidences of glandular upset are manifest, their use is indicated only in the mind of the glandular faddist.

Essensen recommends thyroid and testicular gland substance in men. Ovarian substance, corpus luteum, and antuitrin S in women.⁽²¹⁾ (A little research in the relationship of sexgland and sex life might clear up this little point)

Surgery - Crile (12 & 13) and DeCoursey (16) claim good results in neurocirculatory asthenia following adrenal denervation. This can be explained in part from the etiological theory that there

is, in these persons, a hypersensitivity to epinephrine, and a general sympathetic hypersensitivity.

1. Etiology - The chief etiological factors are (a) Psychic make-up of the individual (b) Constitutional type of individual - usually the small, underweight type. (c) Emotional background and hereditary weakness of an emotional nature. These people are poorly adjusted and have poorly developed emotional control. Sex factor is incidental to the general emotional difficulties. (d) Hypersensitivity of the sympathetic nervous system. (e) Hypersensitivity to stimulants such as coffee, tea, tobacco, and alcohol. (f) Infection - influenza, pneumonia, tuberculosis, and rheumatic fever play a role in bringing on or aggravating cardiac neurosis, especially during convalescence.

2. Symptoms - (a) Sighing respiration
(b) Palpitation and cardiac arrhythmias
(c) Heart pain and hyperalgesia of precordium
(d) Fatigue with slight effort
(e) Weakness, syncope, and vertigo,
(f) Anxiety
(g) Cold, cyanotic extremities.

3. Diagnosis - based upon finding the above symptoms in a neurotic individual with no organic findings even after thorough and painstaking examination.

4. Treatment - Directed to showing the patient the reason for his difficulty. Changing his philosophy and environment as much as possible. Reassurance and explanation, often repeated. Temporary sedation. Graded exercise and planned regime.

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